

Spatial Disaggregation Techniques for Visualizing and Evaluating Map Unit Composition

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Agenda

- What is Spatial Disaggregation?
- Premise and Purpose
- Case Studies
 - Berkeley County, WV (Proof of Concept)
 - Denali National Park and Preserve, AK
- Conclusions

Spatial Disaggregation

- The process of *separating an entity into component parts based on implicit spatial relationships or patterns*

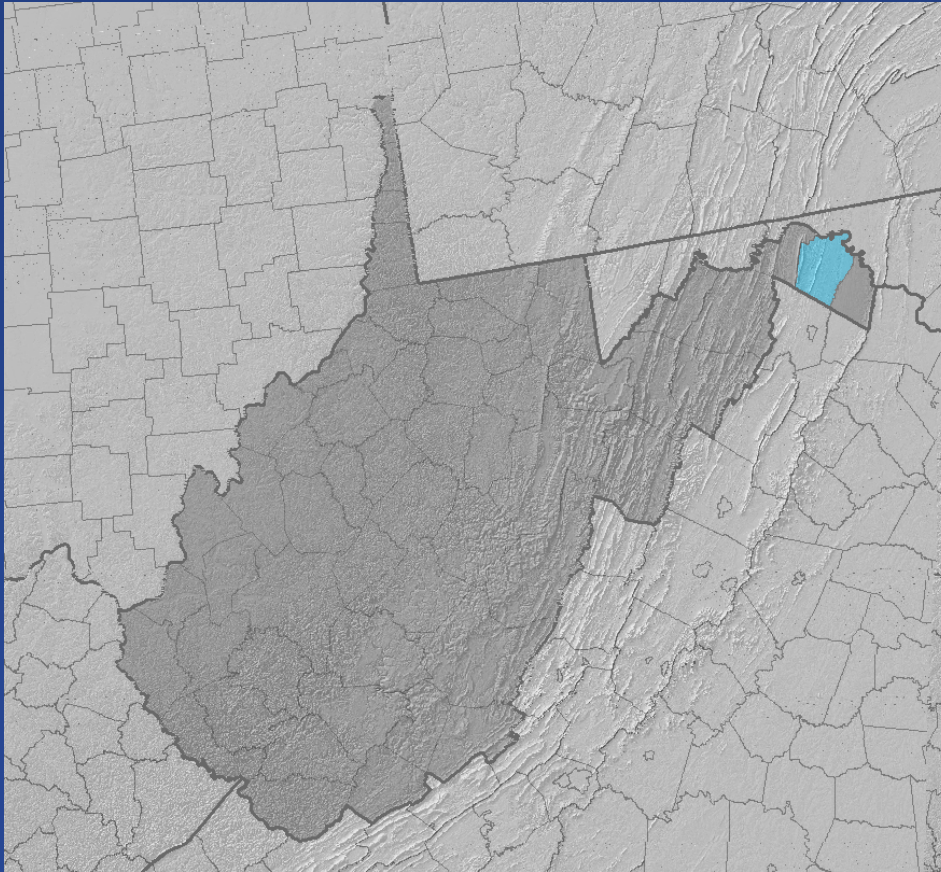
Premise

- Soil map units can be disaggregated into individual components based on soil-landscape relationships documented in existing soil surveys
 - Soil-landscape models are commonly embedded in soil map unit descriptions in soil survey reports or stored as a series of values within the aggregate database
 - These values can be extracted and used to develop quantitative representations of soil-landscape models
 - The resulting models can be extrapolated (e.g., mapped) using any number of ancillary data layers and GIS and/or remote sensing methods

Purpose

- To model distribution of individual components within a map unit in order to:
 - Visualize and evaluate soil-landscape relationships documented in our aggregate data
 - Enable more precise estimation of component or map unit properties
 - Assist with correlation across multiple survey areas within an MLRA
 - Provide support component-level interpretations (e.g., ecological site maps)

Berkeley County, WV



In cooperation with
West Virginia Agricultural
and Forestry Experiment
Station

Soil Survey of Berkeley County, West Virginia



Soil Map Units

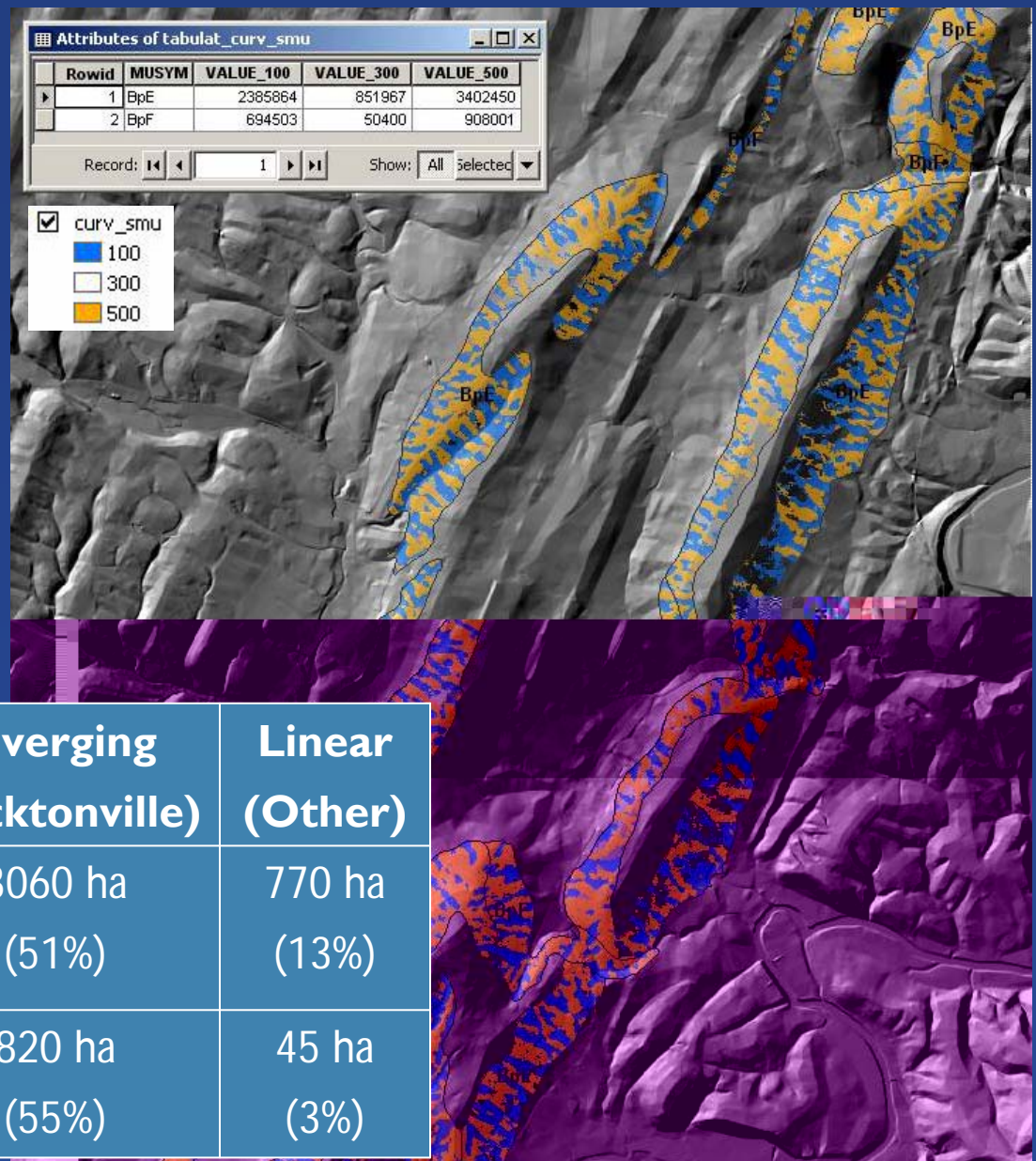
- BpE – Blackthorn-Pecktonville very gravelly loams, 15-45 % slopes, extremely stony
 - (50% Blackthorn, 40% Pecktonville, 10% dissimilar inclusions)
- BpF – Blackthorn-Pecktonville very gravelly loams, 35-45 % slopes, extremely stony
 - (60% Blackthorn, 30% Pecktonville, 10% dissimilar inclusions)

Simple Landscape Model

- Blackthorn soils are primarily found in concave landscape positions
- Pecktonville soils are primarily found in convex landscape positions

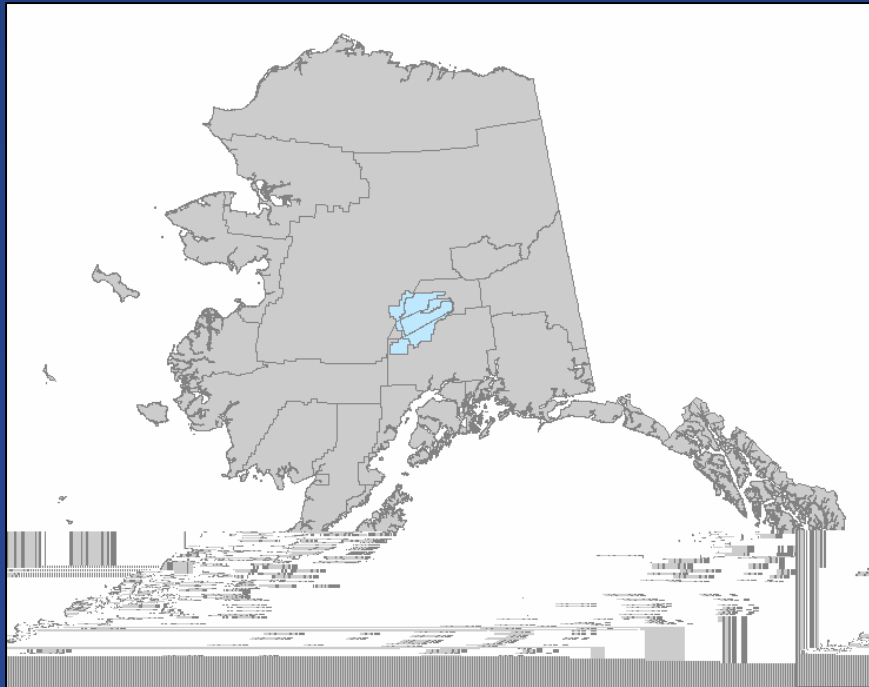


- **Blue (100)** –
converging flow areas:
Blackthorn soils
- **Orange (500)** –
diverging flow areas:
Pecktonville soils
- **Transparent (300)** –
linear flow areas:
Unknown soils

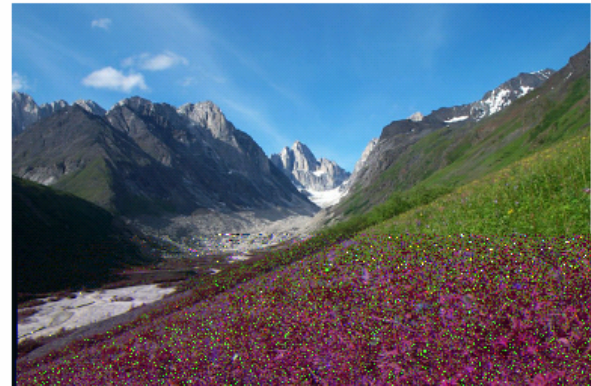


	Converging (Blackthorn)	Diverging (Pecktonville)	Linear (Other)
BpE	2150 ha (36%)	3060 ha (51%)	770 ha (13%)
BpF	625 ha (42%)	820 ha (55%)	45 ha (3%)

Denali National Park, AK



Soil Survey of Denali National Park Area, Alaska

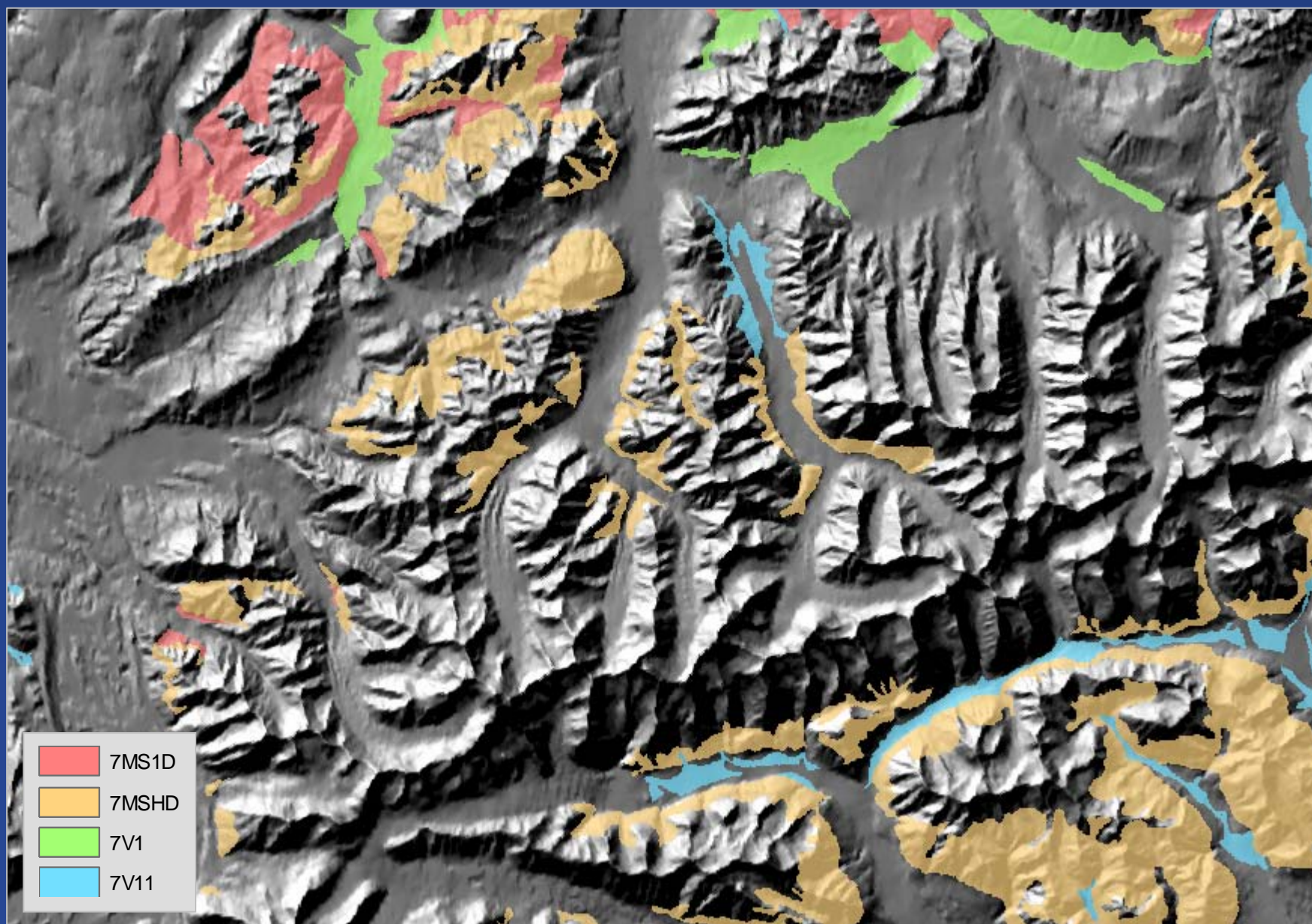


Map Unit Selection Criteria

- Have well-documented soil-landscape relationships;
- Have appropriate geospatial data layers available; and
- Have soil-landscape relationships that can be adequately characterized by available geospatial data.

Selected Soil Map Units

- 7MS1D – Alpine Dark Sedimentary Mountains
- 7MSHD – Alpine Dark Sedimentary Mountains, High Elevation
- 7V1 – Alpine Lower Mountain Slopes and Fans with Discontinuous Permafrost
- 7V11 – Alpine Fans



Soil Landscape Model Development

- Identified NASIS data elements that might contain useful information about the soil forming environment
 - Slope gradient, Elevation, Aspect, Mean Annual Precipitation, Potential Vegetation, Geomorphic Description (Feature Type and Feature Name), Hillslope Profile, Slope Shape Across, Slope Shape Up/Down, Parent Material Group
 - Recorded values for selected data elements by map unit and component (major and minor)

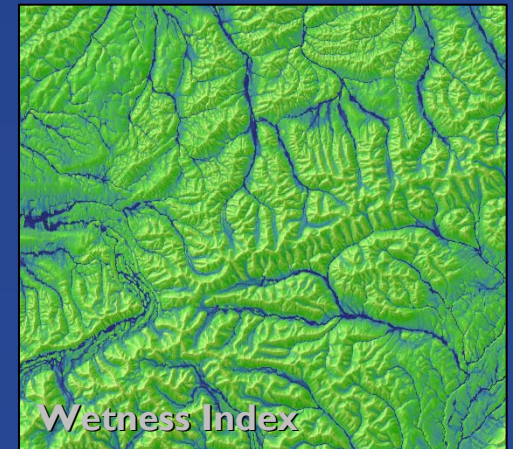
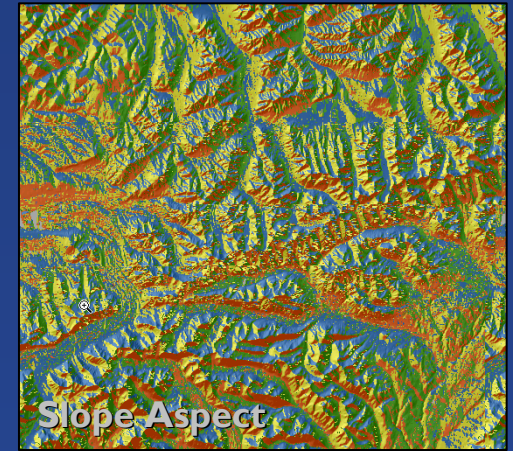
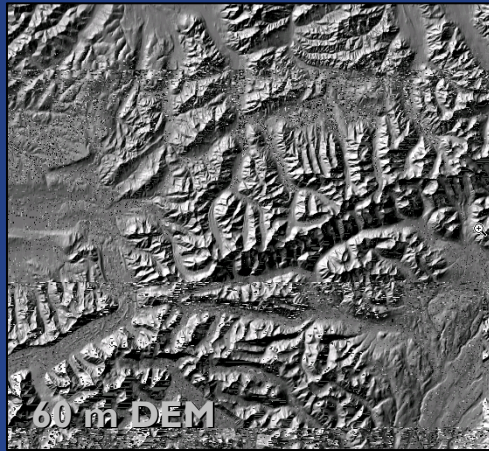
Soil Landscape Model Development

- Reviewed NASIS data and looked for unique values that could be used to model individual components in a map unit
 - For instance, if a map unit consists of two components and the first is found predominantly on north-facing slopes and the second on south-facing slopes, aspect can be used to predict the distribution of these soils within the map unit
- Selected (or created) GIS data layers to represent key landscape characteristics

Soil Landscape Model Development

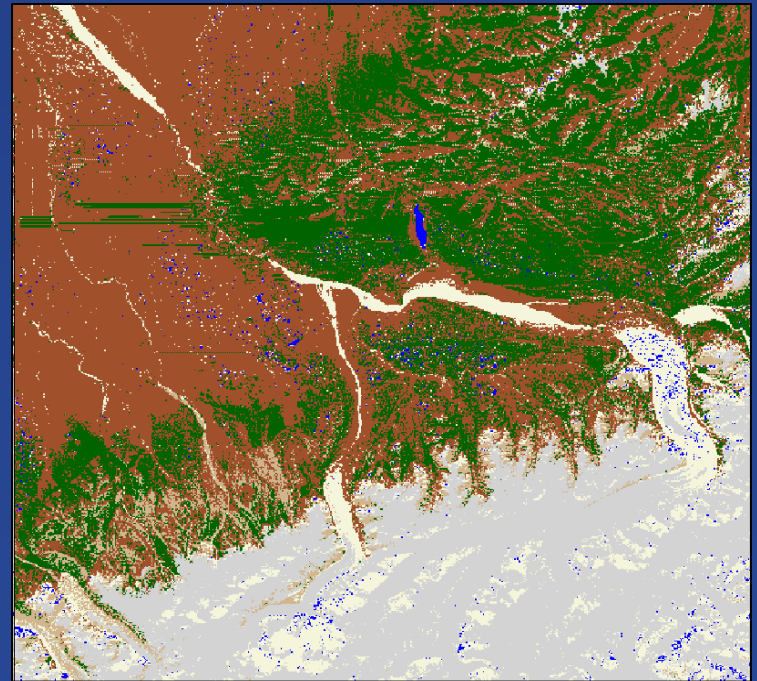
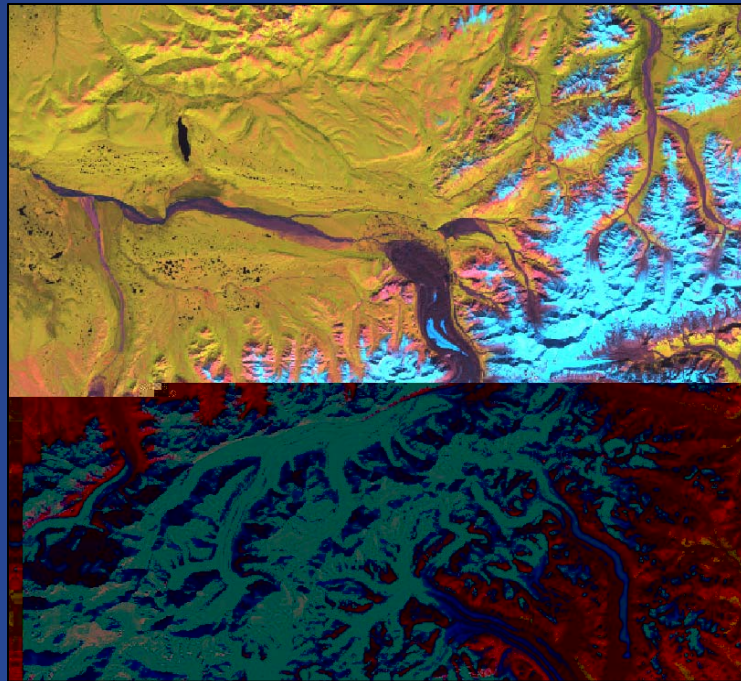
- Developed quantitative rules for each map unit and implemented them in a GIS
 - 7MS1D: Alpine-scrub dark gravelly colluvial slopes = < 3700 ft elevation and linear planform curvature OR linear profile curvature
- Reviewed maps, and edited rules based on comments from the MO 17 Senior Regional Soil Scientist

Key GIS Data Layers

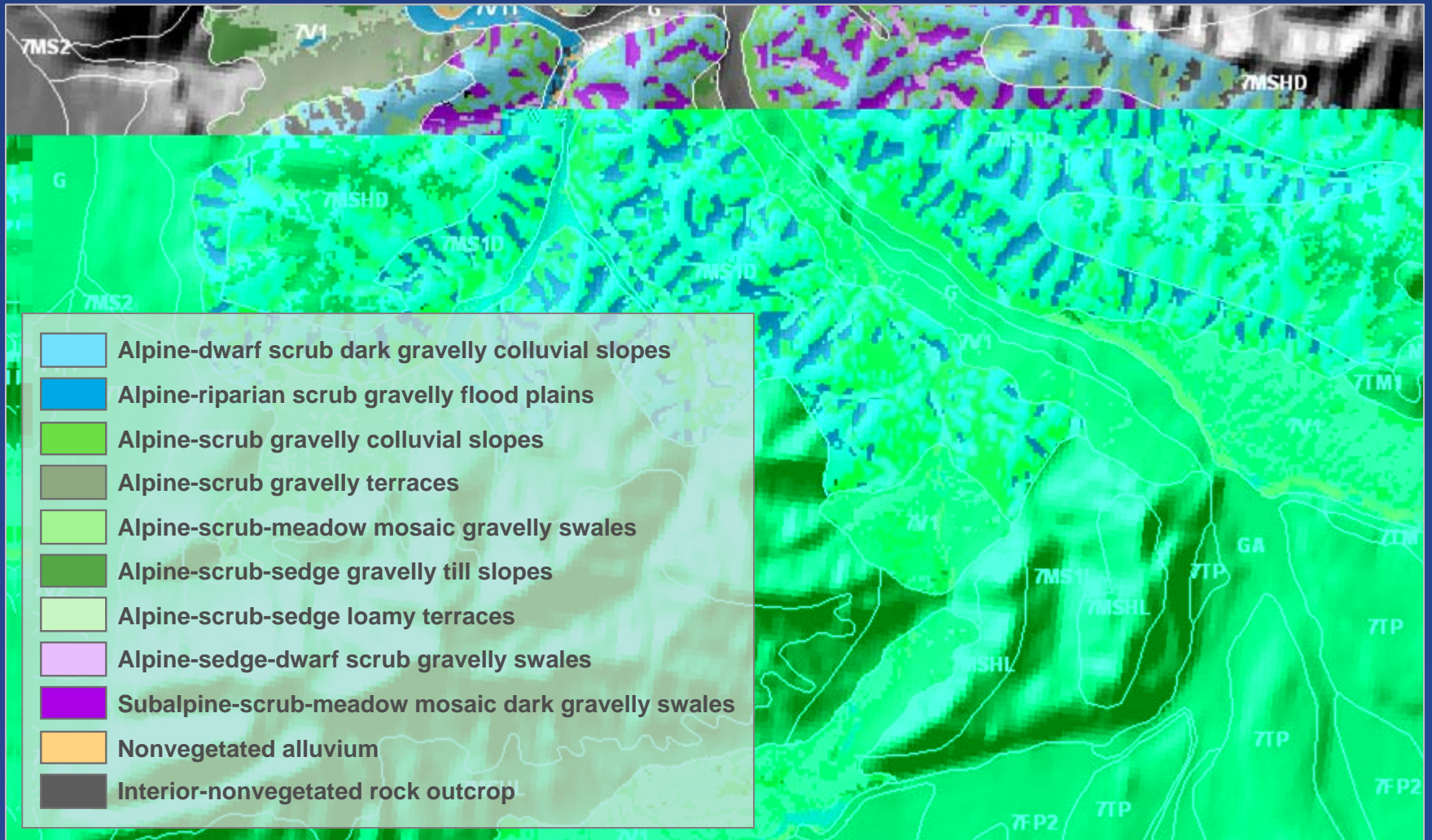


Key GIS Data Layers

- Landsat Scene, 15 class landcover map



Soil Components



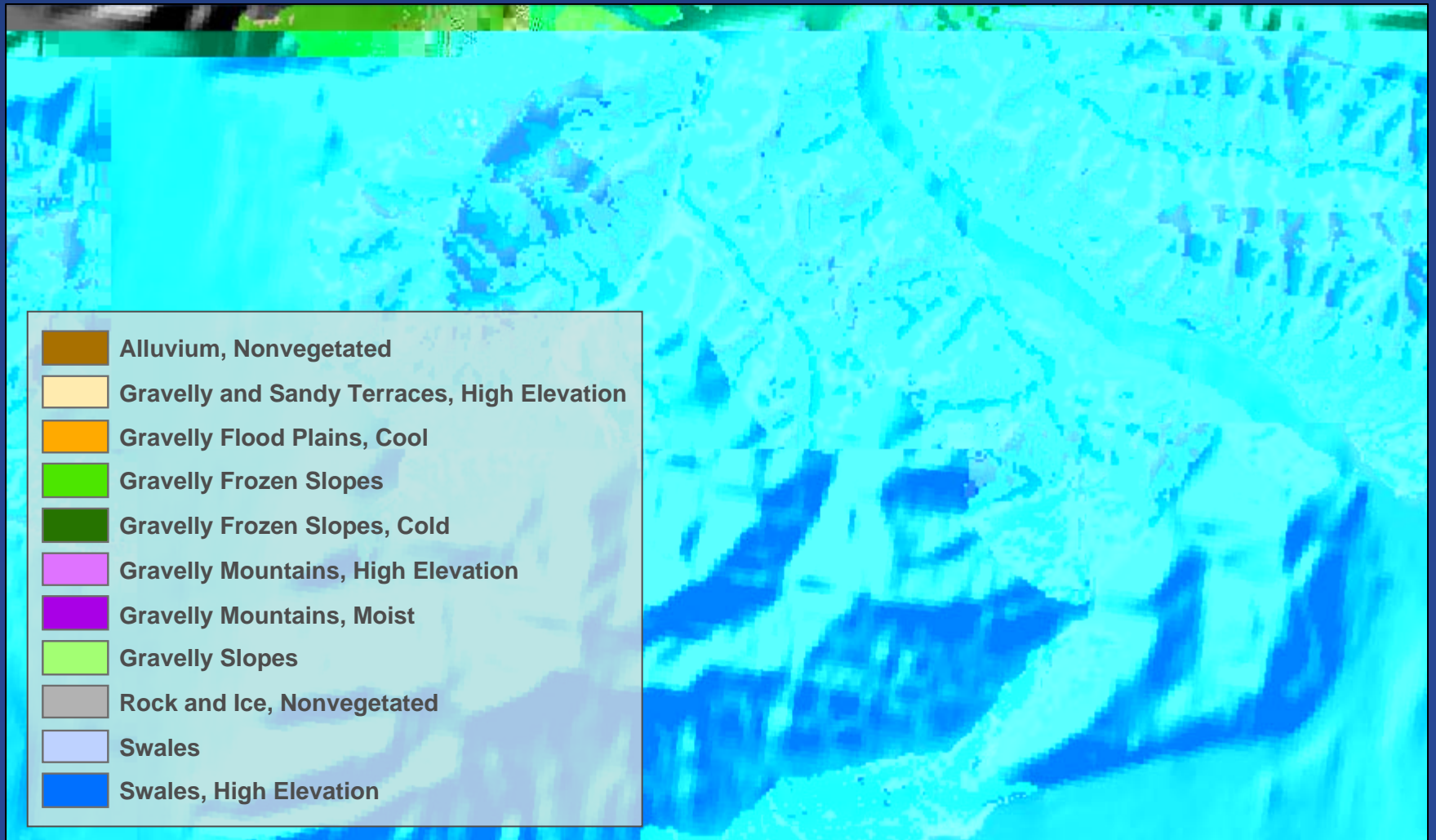
7MSHD – Alpine Dark Sedimentary Mountains, High Elevation

Component	% Composition NASIS	% Composition Component Map
Interior-nonvegetated rock outcrop, ice, talus, and/or drift	25 – 60	16
Alpine-dwarf scrub dark gravelly colluvial slopes	15 – 40	30
Alpine-dwarf scrub dark gravelly colluvial slopes - moist	15 – 30	29
(minor) Alpine-scrub-meadow mosaic gravelly swales	5 – 15	21
(minor) Alpine-sedge-dwarf scrub gravelly swales, frozen	0 – 5	4
Other	0	0

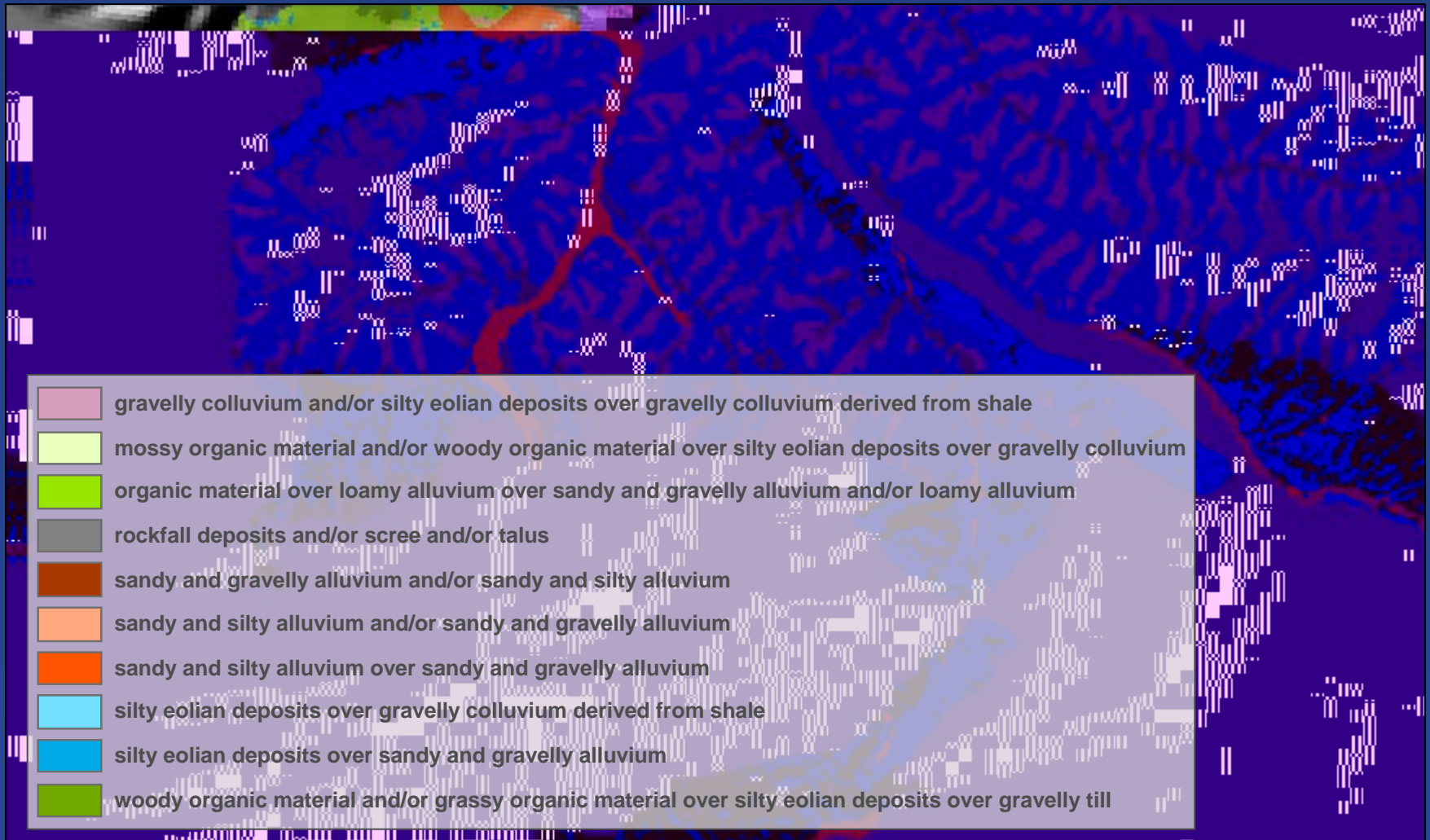
7V11 – Alpine Fans

Component	% Composition NASIS	% Composition Component Map
Alpine-riparian scrub gravelly flood plains	20 – 55	48
Alpine-scrub gravelly terraces	15 – 40	29
Nonvegetated alluvium, riverwash	10 – 40	14
(minor) Alpine-riparian scrub gravelly flood plains, moderately wet	10 – 35	Not Modeled
(minor) Alpine-riparian scrub loamy flood plains	5 – 15	Not Modeled
(minor) Alpine-dwarf scrub gravelly fan terraces	5 – 15	Not Modeled
Other	0	9

Ecological Sites



Parent Material



Issues with Landscape Model Development from NASIS Data

- NASIS data for a particular component may not be fully populated
- Quality of NASIS data may be unknown, or errors may exist in the NASIS database
- Slope, aspect, elevation, and other values may be populated for an entire map unit rather than individual components
- The scales at which slope shape and other morphometric properties are estimated and populated are unknown, and can be variable

Conclusions

- Development of soil component maps from SSURGO and NASIS data allows one to
 - visualize the distribution of soil components on the landscape and within a map unit
 - visualize component-level properties
 - see a spatial representation of soil-landscape information stored in the NASIS aggregate data

Conclusions

- Ability to develop reasonable soil-landscape models from NASIS aggregate data depends on the completeness and accuracy of data in the database
- Expert knowledge is required to resolve errors or conflicts

Acknowledgements

- Mark Clark, Senior Regional Soil Scientist, MO-17
- Darrell Kautz, Business Analyst, NGDC

Questions?